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Kato et al.

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(54) **IMAGE FORMING APPARATUS INCLUDING POWER FEEDING MEMBERS CONFIGURED TO HOLD A CIRCUIT BOARD**

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CPC ***G03G 15/80*** (2013.01)

(58) **Field of Classification Search**
CPC G03G 15/80
USPC 399/88, 89, 90
See application file for complete search history.

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(57) **ABSTRACT**

An image forming apparatus including: a plurality of process units; a circuit board configured to generate voltages to be applied to the plurality of process units; and a plurality of separate power feeding members configured to supply the voltages to the process units, wherein the plurality of separate power feeding members holds the circuit board, the circuit board including: a plurality of voltage output portions arranged at different positions in a direction along an outer edge of the circuit board; and a plurality of positioning holes configured to position the plurality of separate power feeding members, and wherein the plurality of separate power feeding members each includes: a connecting portion to be connected to a corresponding one of the voltage output portions; a positioning portion to be fitted into a corresponding one of the positioning holes; and a latching portion configured to latch the circuit board.

8 Claims, 5 Drawing Sheets

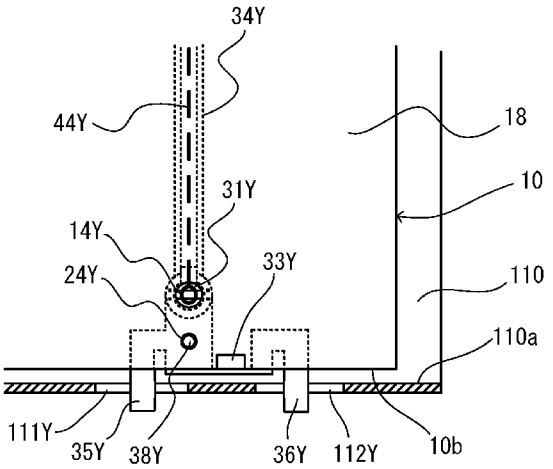
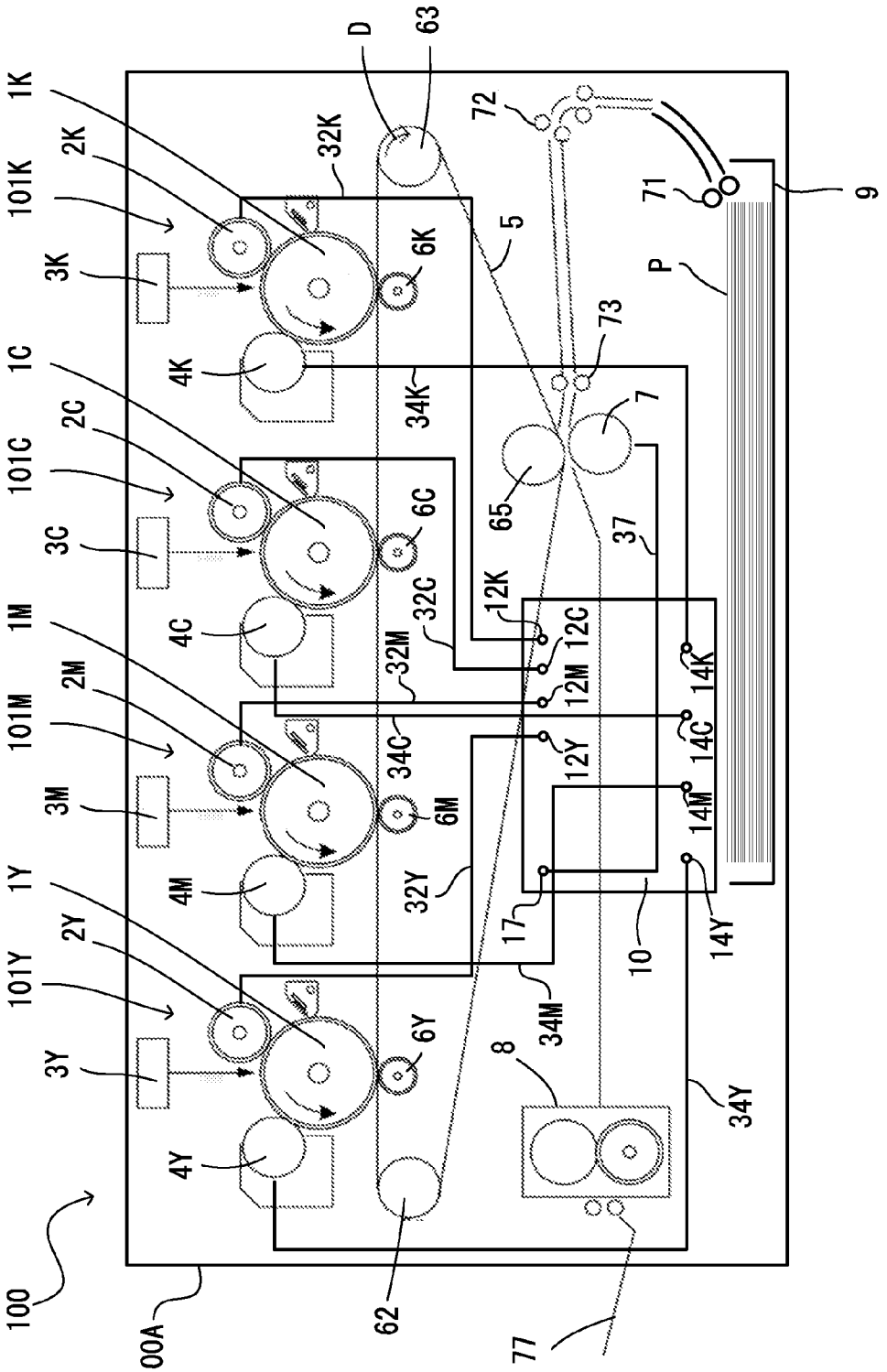


FIG. 1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2K
101K
3K
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32K
6K
D
63
72
71
9
5
P
73
1C
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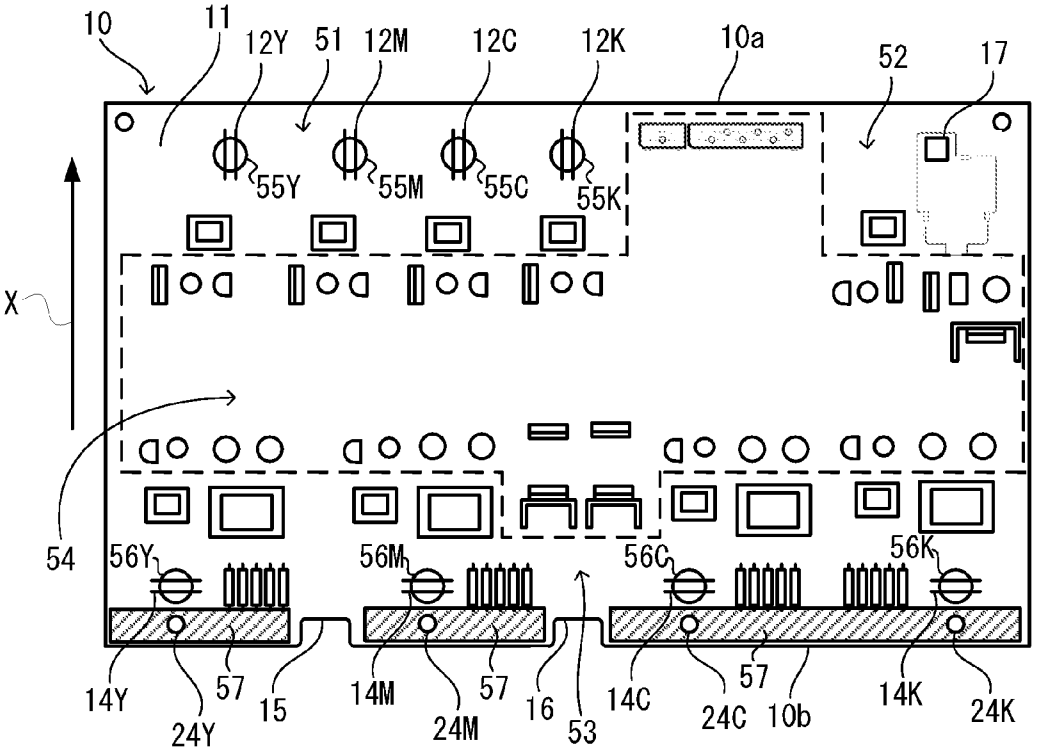
101C
3C
4C
34K
7
65
37
6C
12K
32C
1M
2M
101M
3M
4M
32M
12C
12M
14K
34C
12Y
14C
6M
14M
32Y
17
10
14Y
1Y
2Y
101Y
3Y
4Y
6Y
8
34M
34Y
100
100A
62
77

FIG. 2A


10
11
12Y
51
12M
12C
12K
10a
52
17
55Y
55M
55C
55K
X
54
56Y
56M
56C
56K
14Y
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14M
24M
57
16
53
14C
24C
57
10b
14K
24K

FIG. 2B

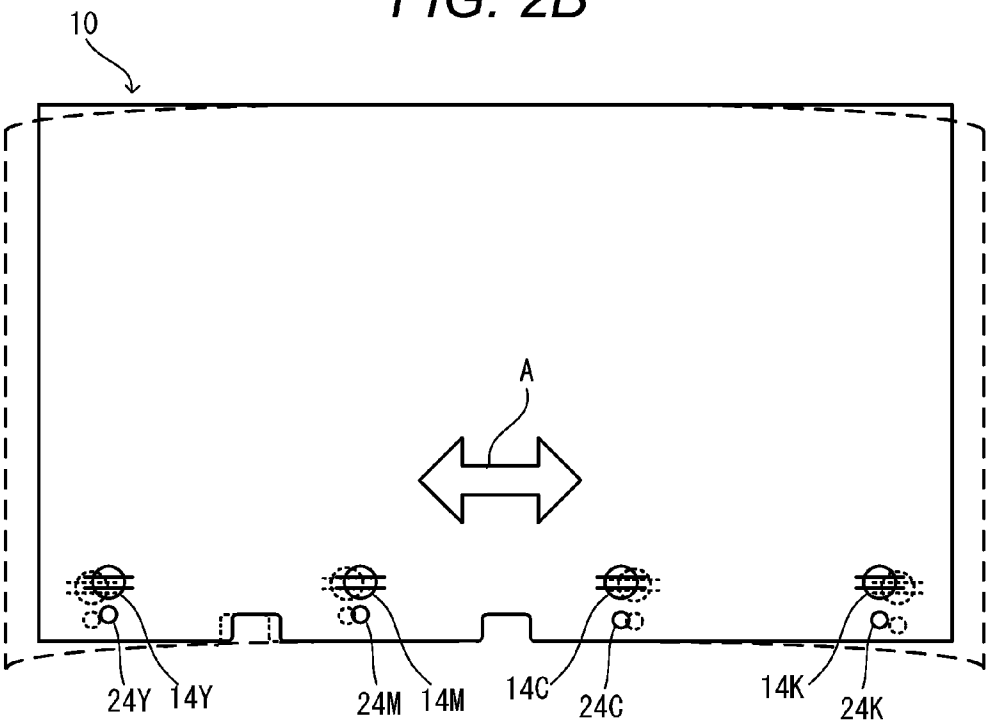
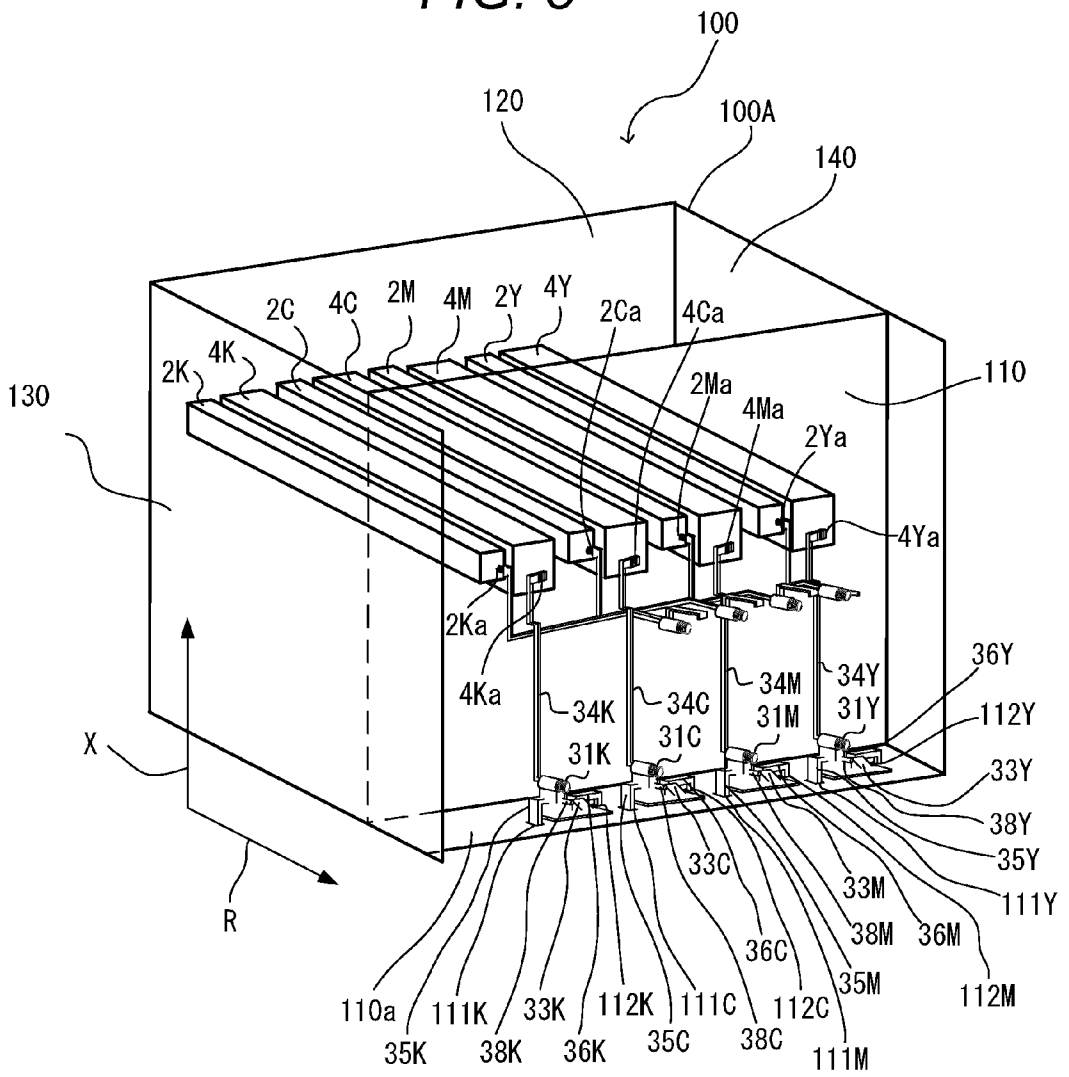

10
A
24Y
14Y
24M
14M
14C
24C
14K
24K

FIG. 3


100
120
100A
140
2C
4C
2M
4M
2Y
4Y
2Ca
4Ca
2K
4K
130
110
2Ma
4Ma
2Ya
4Ya
2Ka
4Ka
34K
34C
34M
34Y
36Y
31K
31C
31M
31Y
112Y
33Y
38Y
35Y
111Y
X
R
110a
111K
33K
112K
111C
33C
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36K
35C
38C
36C
35M
111M

FIG. 4A

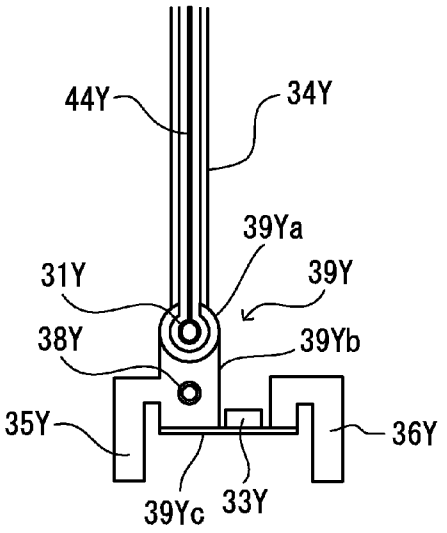

FIG. 4B

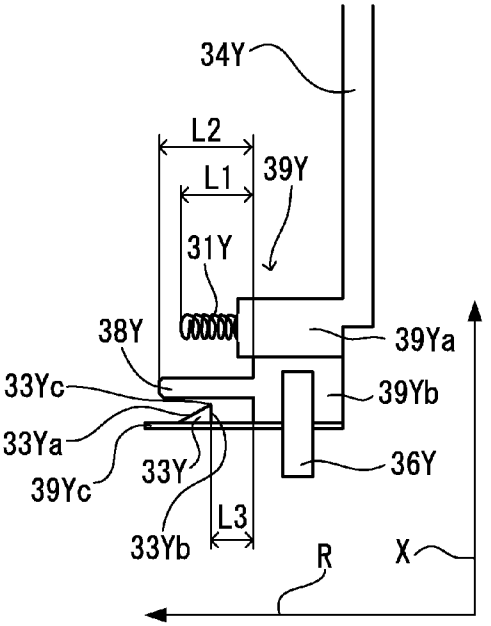

FIG. 4C

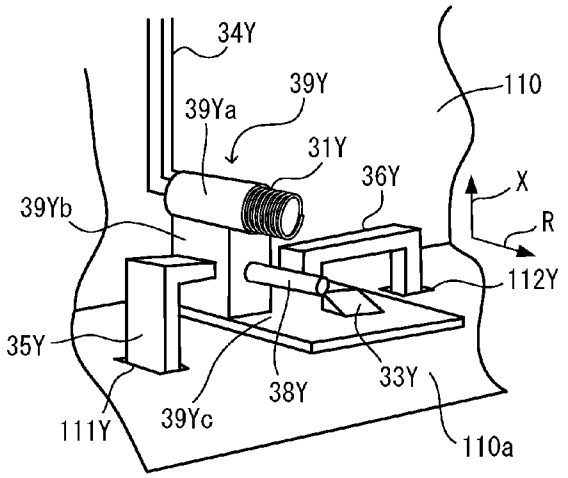

FIG. 4D

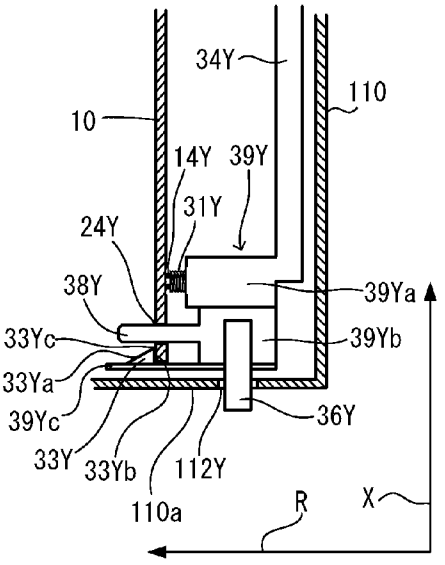

FIG. 5A

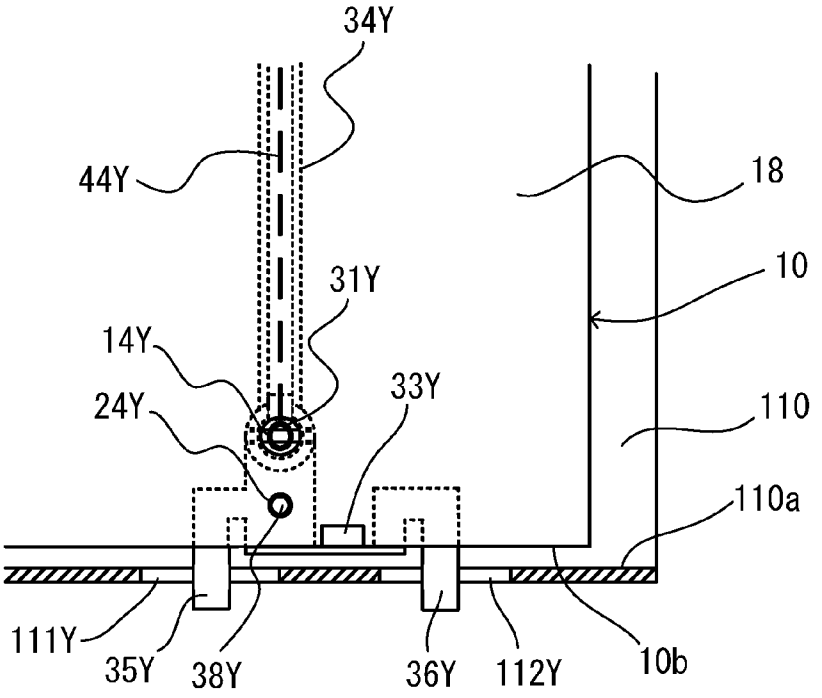
34Y
44Y
18
10
31Y
14Y
33Y
24Y
110
110a
111Y
35Y
38Y
36Y
112Y
10b

FIG. 5B

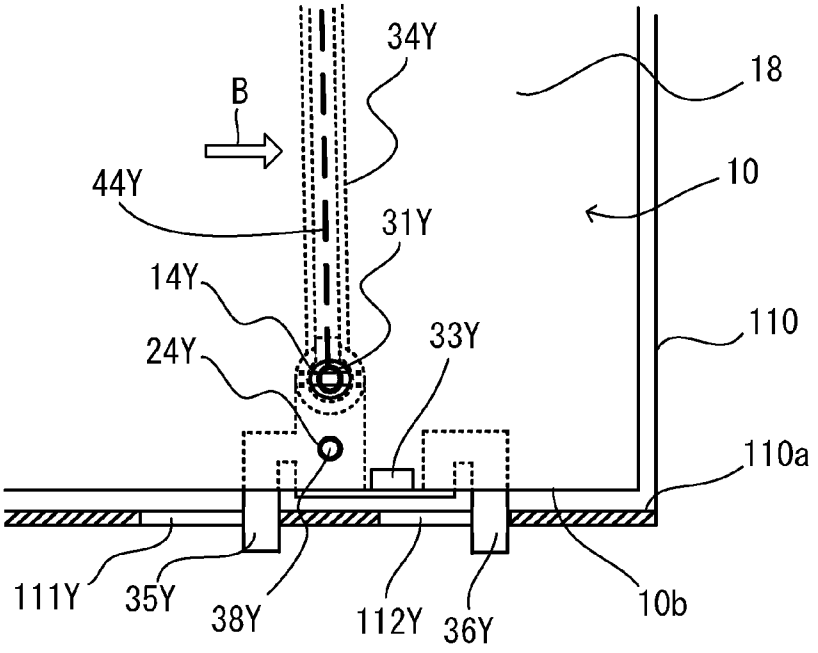
34Y
B
18
44Y
10
31Y
14Y
110
33Y
24Y
110a
111Y
35Y
38Y
112Y
36Y
10b

IMAGE FORMING APPARATUS INCLUDING POWER FEEDING MEMBERS CONFIGURED TO HOLD A CIRCUIT BOARD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an image forming apparatus configured to form an image on a recording medium.

2. Description of the Related Art

An electrophotographic image forming apparatus is configured to form an image on a recording medium using an electrophotographic image forming process. As the electrophotographic image forming apparatus, for example, there are known an electrophotographic copying machine (such as digital copying machine), an electrophotographic printer (such as color laser beam printer and color LED printer), a multifunction peripheral (MFP), a facsimile apparatus, and a word processor. The electrophotographic image forming apparatus (hereinafter referred to as "image forming apparatus") not only encompasses an image forming apparatus configured to form a monochrome image but also encompasses a color image forming apparatus configured to form a color image.

The image forming apparatus includes a plurality of process units such as a photosensitive member, a charging device, a light scanning device (exposure device), a developing device, a transferring device, and a fixing device. The charging device uniformly charges a surface of the photosensitive member (image bearing member). The light scanning device emits a laser beam (hereinafter referred to as "light beam") modulated in accordance with image information onto the uniformly charged surface of the photosensitive member so as to form an electrostatic latent image on the surface of the photosensitive member. The developing device develops the electrostatic latent image into a developer image (toner image) using a developer (toner). The transferring device transfers the toner image, which is formed on the surface of the photosensitive member, onto the recording medium. The fixing device fixes the toner image onto the recording medium by heating and pressurizing the recording medium having the toner image transferred thereon. In this manner, the image forming apparatus forms an image on the recording medium.

The image forming apparatus includes a high-voltage circuit board configured to apply a high voltage to each of the photosensitive member, the charging device, the developing device, the transferring device, and the fixing device.

The photosensitive member, the charging device, the developing device, the transferring device, and the fixing device are electrically connected to the high-voltage circuit board through respective power feeding members.

U.S. Pat. No. 8,750,745 discloses an image forming apparatus including power feeding members which are electrically connected to respective high-voltage contact portions of a high-voltage circuit board through springs and hold the high-voltage circuit board.

However, in the related art, the plurality of power feeding members configured to feed high voltages to a plurality of process units, respectively, are connected to a single integrated holding member. Therefore, when the high-voltage circuit board is deformed due to heat or force, the position of the high-voltage contact portion of the high-voltage circuit board may be displaced from the position of the spring of the power feeding member. When the high-voltage contact portion and the spring of the power feeding member are displaced from each other, there is a problem in that reliability of electrical connection is degraded.

SUMMARY OF THE INVENTION

To address the above-mentioned problem, according to one embodiment of the present invention, there is provided an image forming apparatus configured to form an image on a recording medium, the image forming apparatus comprising:

a plurality of process units to which voltages are applied to perform image forming processes;

a circuit board configured to generate the voltages to be applied to the plurality of process units, respectively; and

a plurality of separate power feeding members configured to supply the voltages generated by the circuit board to the plurality of process units, respectively,

wherein the plurality of separate power feeding members are configured to hold the circuit board,

wherein the circuit board comprises:

a plurality of voltage output portions configured to output the voltages to be applied to the plurality of process units, respectively, the plurality of voltage output portions being arranged at different positions in a direction along an outer edge of the circuit board; and

a plurality of positioning holes configured to position the plurality of separate power feeding members, respectively, and

wherein the plurality of separate power feeding members each comprises:

a connecting portion to be connected to a corresponding one of the plurality of voltage output portions of the circuit board;

a positioning portion to be fitted into a corresponding one of the plurality of positioning holes of the circuit board, the positioning portion being arranged at a position closer to the outer edge of the circuit board than a position of the connecting portion; and

a latching portion configured to latch the circuit board, the latching portion being arranged at a different position from the position of the positioning portion in the direction along the outer edge.

Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an explanatory view of an image forming apparatus.

FIGS. **2**A and **2**B are explanatory views of a high-voltage circuit board.

FIG. **3** is an explanatory view of power feeding members mounted on a main body of the image forming apparatus.

FIGS. **4**A, **4**B, **4**C, and **4**D are explanatory views of the power feeding member.

FIGS. **5**A and **5**B are explanatory views of the power feeding member holding the high-voltage circuit board.

DESCRIPTION OF THE EMBODIMENTS

Now, an embodiment of the present invention will be described.

(Image Forming Apparatus)

FIG. **1** is an explanatory view of an image forming apparatus **100**. The image forming apparatus **100** is configured to

form an image on a recording medium P using an electrophotographic image forming process.

A main body **100**A of the image forming apparatus **100** includes four image forming portions **101** (**101**Y, **101**M, **101**C, and **101**K). The image forming portion **101**Y is configured to form a yellow image using yellow toner. The image forming portion **101**M is configured to form a magenta image using magenta toner. The image forming portion **101**C is configured to form a cyan image using cyan toner. The image forming portion **101**K is configured to form a black image using black toner. The four image forming portions **101** have the same structure except for the colors of the developer (toner), and hence, in the following description, the suffixes Y, M, C, and K are omitted from reference symbols unless otherwise deemed necessary.

The image forming portions **101** include photosensitive drums (image bearing members) **1** (**1**Y, **1**M, **1**C, and **1**K) serving as photosensitive members, respectively. Around the photosensitive drums **1**, there are arranged charging rollers (charging devices) **2** (**2**Y, **2**M, **2**C, and **2**K), light scanning devices **3** (**3**Y, **3**M, **3**C, and **3**K), developing devices **4** (**4**Y, **4**M, **4**C, and **4**K), and primary transfer rollers (primary transfer devices) **6** (**6**Y, **6**M, **6**C, and **6**K), respectively. An endless intermediate transfer belt (intermediate transfer member) **5** is arranged below the photosensitive drums **1**.

The intermediate transfer belt **5** is stretched around a drive roller **62** and two driven rollers **63** and **65**. The intermediate transfer belt **5** rotates in a direction indicated by the arrow D of FIG. **1** at the time of image formation. The primary transfer rollers **6** are arranged across the intermediate transfer belt **5** so as to be opposite to the photosensitive drums **1**, respectively. The primary transfer roller **6** transfers a toner image, which is formed on the photosensitive drum **1**, onto the intermediate transfer belt **5**.

A secondary transfer roller (secondary transfer device) **7** is arranged across the intermediate transfer belt **5** so as to be opposite to the driven roller **65**.

A sheet feeding cassette **9** configured to receive the recording medium P is arranged in a lower part of the image forming apparatus **100**. The recording medium P is fed from the sheet feeding cassette **9** by pick-up rollers **71**. The recording medium P is conveyed to the secondary transfer roller **7** by a conveyance rollers **72** and registration rollers **73**.

A fixing device **8** is arranged on a downstream side of the secondary transfer roller **7** in a conveyance direction of the recording medium P. A delivery tray **77** on which the recording medium P on which an image has been formed is stacked is provided on a downstream side of the fixing device **8** in the conveyance direction of the recording medium P.

(Image Forming Process)

Next, an image forming process of the image forming apparatus **100** will be described. The image forming processes in the four image forming portions **101** are the same, and hence the image forming process in the yellow image forming portion **101**Y will be described. The description of the image forming processes of the magenta image forming portion **101**M, the cyan image forming portion **101**C, and the black image forming portion **101**K is omitted.

The charging roller **2**Y uniformly charges a surface of the photosensitive drum **1**Y. The light scanning device **3**Y emits a light beam modulated in accordance with image information of a yellow component onto the uniformly charged surface of the photosensitive drum **1**Y to form an electrostatic latent image on the photosensitive drum **1**Y. The developing device **4**Y develops the electrostatic latent image using the yellow toner (developer) into a yellow toner image. The primary transfer roller **6**Y primarily transfers the yellow toner image, which is formed on the photosensitive drum **1**Y, onto the intermediate transfer belt **5**.

In the same way, a magenta toner image formed by the magenta image forming portion **101**M is accurately transferred onto the yellow toner image on the intermediate transfer belt **5** in a superimposed manner. Then, a cyan toner image and a black toner image are sequentially transferred onto the magenta toner image on the intermediate transfer belt **5** in a superimposed manner. As a result, the four-color toner images are superimposed on the intermediate transfer belt **5**.

The recording medium P conveyed from the sheet feeding cassette **9** is conveyed to the secondary transfer roller **7** by the registration rollers **73** in synchronization with the toner images on the intermediate transfer belt **5**. The four-color toner images superimposed on the intermediate transfer belt **5** are secondarily transferred onto the recording medium P by the secondary transfer roller **7** in a collective manner.

The recording medium P having the toner images transferred thereon is conveyed to the fixing device **8**. The fixing device **8** fixes the toner images onto the recording medium P by heating and pressurizing the recording medium P. The recording medium P having the image formed thereon is delivered onto the delivery tray **77**.

(High-Voltage Circuit Board)

The image forming apparatus **100** includes a high-voltage circuit board (hereinafter referred to as "circuit board") **10**. The circuit board **10** is configured to generate a high voltage (voltage) to be applied to each of process units such as the photosensitive drum **1**, the charging roller **2**, the developing device **4**, the primary transfer roller **6**, the secondary transfer roller **7**, and the fixing device **8**.

The circuit board **10** includes a plurality of high-voltage contact portions (voltage output portions) **12** (**12**Y, **12**M, **12**C, and **12**K) configured to output high voltages to be applied to the charging rollers (process units) **2** (**2**Y, **2**M, **2**C, and **2**K), respectively. The circuit board **10** is configured to supply the high voltages from the plurality of high-voltage contact portions **12** to the plurality of charging rollers **2** via a plurality of separate power feeding members **32** (**32**Y, **32**M, **32**C, and **32**K), respectively.

The circuit board **10** includes a plurality of high-voltage contact portions (voltage output portions) **14** (**14**Y, **14**M, **14**C, and **14**K) configured to output high voltages to be applied to the developing devices (process units) **4** (**4**Y, **4**M, **4**C, and **4**K), respectively. The circuit board **10** is configured to supply the high voltages from the plurality of high-voltage contact portions **14** to the plurality of developing devices **4** via a plurality of separate power feeding members **34** (**34**Y, **34**M, **34**C, and **34**K), respectively.

The circuit board **10** is configured to supply a high voltage from a high-voltage contact portion (voltage output portion) **17** to the secondary transfer roller **7** via a power feeding member **37**.

FIGS. **2**A and **2**B are explanatory views of the high-voltage circuit board **10**. FIG. **2**A is a plan view of the circuit board **10**. FIG. **2**B is an explanatory view of thermal deformation of the circuit board **10**.

In FIG. **2**A, a vertical direction is indicated by the arrow X. Various electrical components and electronic components are mounted on a mounting surface **11** of the circuit board **10**. The circuit board **10** includes the high-voltage contact portions **12**Y, **12**M, **12**C, and **12**K in a high-voltage portion **51** on a side of an upper edge (outer edge) **10***a*. The high-voltage contact portions **12**Y, **12**M, **12**C, and **12**K are arranged in the vicinity of the upper edge **10***a* at different positions in a direction along the upper edge **10***a*. The circuit board **10**

includes the high-voltage contact portion **17** in a high-voltage portion **52** in the vicinity of the upper edge **10***a*.

The circuit board **10** includes the high-voltage contact portions **14**Y, **14**M, **14**C, and **14**K in a high-voltage portion **53** on a side of a lower edge (outer edge) **10***b*. The high-voltage contact portions **14**Y, **14**M, **14**C, and **14**K are arranged in the vicinity of the lower edge **10***b* at different positions in a direction along the lower edge **10***b*. Further, low-voltage components for generating and controlling a high voltage are arranged in a center portion **54** of the circuit board **10**.

The high-voltage contact portions **12**Y, **12**M, **12**C, and **12**K are each formed of two jumper wires. The high-voltage contact portions **12**Y, **12**M, **12**C, and **12**K are configured to feed the high voltages to the charging rollers **2**Y, **2**M, **2**C, and **2**K via the power feeding members **32**Y, **32**M, **32**C, and **32**K, respectively. Holes **55** (**55**Y, **55**M, **55**C, and **55**K) are formed in the circuit board **10**. Each of the holes **55** is arranged under the two jumper wires of each of the high-voltage contact portions **12**Y, **12**M, **12**C, and **12**K.

The contact between the high-voltage contact portion **12** and the power feeding member **32** can be visually confirmed through the hole **55**.

The high-voltage contact portion **17** is an output portion of a fly back transformer. The high-voltage contact portion **17** is configured to feed the high voltage to the secondary transfer roller **7** via the power feeding member **37**.

The high-voltage contact portions **14**Y, **14**M, **14**C, and **14**K are each formed of two jumper wires. The high-voltage contact portions **14**Y, **14**M, **14**C, and **14**K are configured to feed the high voltages to the developing devices **4**Y, **4**M, **4**C, and **4**K via the power feeding members **34**Y, **34**M, **34**C, and **34**K, respectively. Holes **56** (**56**Y, **56**M, **56**C, and **56**K) are formed in the circuit board **10**. Each of the holes **56** is arranged under the two jumper wires of each of the high-voltage contact portions **14**Y, **14**M, **14**C, and **14**K. The contact between the high-voltage contact portion **14** and the power feeding member **34** can be visually confirmed through the hole **56**.

Boss holes (positioning holes) **24** (**24**Y, **24**M, **24**C, and **24**K) are formed in the circuit board **10**. Each of the boss holes **24** are arranged below the respective high-voltage contact portions **14**Y, **14**M, **14**C, and **14**K in the vertical direction X. It is appropriate that the boss hole **24** be formed right below the high-voltage contact portion **14**. A boss (positioning portion) **38** (**38**Y, **38**M, **38**C, and **38**K) (described later in FIG. **3**) of the power feeding member **34** is inserted into the boss hole **24** so as to position the power feeding member **34** and the high-voltage contact portion **14**. The boss hole **24** may be formed as a recessed portion serving as a positioning portion configured to position the power feeding member **34** and the high-voltage contact portion **14**.

A creepage distance from the high-voltage portion **53** needs to be secured in regions (regions hatched in FIG. **2**A) **57** between the high-voltage contact portions **14** configured to output the high voltage and the lower edge **10***b* of the circuit board **10**, and hence electrical (electronic) components cannot be arranged in the regions **57**. The boss hole **24** is formed in the region **57** in which the electrical (electronic) components cannot be arranged.

Furthermore, in order to enhance the workability at the time of removing the circuit board **10**, cutouts (recessed portions) **15** and **16** having a sufficient size to insert a finger are formed in the lower edge **10***b* of the circuit board **10**.

The circuit board **10** is liable to be deflected or thermally deformed due to its large dimensions. As illustrated in FIG. **2**B, when thermally deformed, the circuit board **10** expands in both directions as indicated by the arrow A. When the circuit board **10** is deformed as described above, the high-voltage contact portion **14** may be displaced from a position in a normal state.

(Power Feeding Member)

Next, the power feeding members **34** will be described. The power feeding members **34** have a function of feeding the high voltages from the high-voltage contact portions **14** of the circuit board **10** to the respective developing devices **4**. Furthermore, the power feeding members **34** have a function of holding the circuit board **10**.

FIG. **3** is an explanatory view of the power feeding members **34**Y, **34**M, **34**C, and **34**K mounted on the main body **100**A of the image forming apparatus **100**. FIG. **3** is a rear view of the main body **100**A of the image forming apparatus **100**. A frame of the main body **100**A is formed of a front plate **120** arranged on a front side of the main body **100**A, a right plate **130** arranged on a right side of the main body **100**A in front view, a left plate **140** arranged on a left side of the main body **100**A in front view, and a rear plate **110** arranged on a rear side of the main body **100**A.

The power feeding members **34**Y, **34**M, **34**C, and **34**K are mounted on the rear plate **110** so as to be separate from one another.

The charging rollers **2**Y, **2**M, **2**C, and **2**K and the developing devices **4**Y, **4**M, **4**C, and **4**K are supported by supporting members (not shown) mounted on the front plate **120** and the rear plate **110**, respectively. The charging rollers **2**Y, **2**M, **2**C, and **2**K and the developing devices **4**Y, **4**M, **4**C, and **4**K have, on the side of the rear plate **110**, electrical contacts **2**Ya, **2**Ma, **2**Ca, and **2**Ka and electrical contacts **4**Ya, **4**Ma, **4**Ca, and **4**Ka, respectively.

Circuit boards or the like (not shown) and driving components (not shown) are mounted on the rear plate **110**. The circuit board **10** is mounted on the rear plate **110** so as to be held by the power feeding members **34**Y, **34**M, **34**C, and **34**K mounted on the rear plate **110**.

The power feeding members **34**Y, **34**M, **34**C, and **34**K have the same shape. The power feeding members **34**Y, **34**M, **34**C, and **34**K are mounted on the rear plate **110** at the same intervals as those of the developing devices **4**Y, **4**M, **4**C, and **4**K. The power feeding members **34**Y, **34**M, **34**C, and **34**K are mounted on the rear plate **110** by each fitting a mold member **39** (ex. a mold member **39**Y (FIG. **4**A)) into mounting holes **111** (**111**Y, **111**M, **111**C, and **111**K) and **112** (**112**Y, **112**M, **112**C, and **112**K) opened in the rear plate **110**.

As illustrated in FIG. **5**B described later, the power feeding members **34**Y, **34**M, **34**C, and **34**K are movable in a horizontal direction by approximately several millimeters even after being mounted on the rear plate **110**. After the power feeding members **34**Y, **34**M, **34**C, and **34**K are mounted on the rear plate **110**, the circuit board **10** is mounted on the rear plate **110** so that, while causing the mounting surface to face the rear plate **110**, the high-voltage contact portions **12** and **14** are held in contact with the respective power feeding members **32** and **34**. The contact between the high-voltage contact portion **14** and the power feeding member **34** can be visually confirmed through the hole **56** formed in the high-voltage contact portion **14** of the circuit board **10**.

The power feeding members **34**Y, **34**M, **34**C, and **34**K are separate from one another. The power feeding members **34**M, **34**C, and **34**K are the same as the power feeding member **34**Y. Therefore, the power feeding member **34**Y will be described below, and description of the power feeding members **34**M, **34**C, and **34**K is omitted.

FIGS. **4**A, **4**B, **4**C, and **4**D are explanatory views of the power feeding member **34**Y. FIG. **4**A is a front view of the power feeding member **34**Y. FIG. **4**B is a side view of the

power feeding member **34**Y. FIG. **4**C is a perspective view of the power feeding member **34**Y mounted on the rear plate **110**. FIG. **4**D is a side view of the power feeding member **34**Y holding the circuit board **10**.

The power feeding member **34**Y includes a wire (conductor) **44**Y, a spring (conducting elastic member) **31**Y, and a mold member (holding member) **39**Y configured to hold the spring **31**Y. The power feeding member **34**Y is configured to hold the circuit board **10** by the mold member **39**Y.

The wire **44**Y extends inside the power feeding member **34**Y, and is electrically connected to the electrical contact **4**Ya of the developing device **4**Y. The mold member **39**Y includes a holding portion **39**Ya configured to hold the spring **31**Y, a base portion **39**Yb which extends downward from the holding portion **39**Ya, and a supporting plate **39**Yc fixed to a lower portion of the base portion **39**Yb. A boss (protruding portion) **38**Y is formed on the base portion **39**Yb of the mold member **39**Y.

A latching portion (hereinafter referred to as "holding claw") **33**Y configured to latch the circuit board is formed on the supporting plate **39**Yc of the mold member **39**Y. As illustrated in FIG. **5**A described later, when the circuit board **10** is held by the power feeding member **34**Y, the holding claw **33**Y is arranged at a different position from that of the boss **38**Y in the direction along the lower edge (outer edge) **10***b* of the circuit board **10**.

The spring **31**Y is a connecting portion configured to electrically connect the wire **44**Y connected to the developing device **4**Y and the high-voltage contact portion **14**Y on the circuit board **10** to each other. The spring **31**Y is a conducting elastic member having a coil shape. The spring **31**Y is pressed toward the high-voltage contact portion **14**Y while being held in contact with the high-voltage contact portion **14**Y so that the spring **31**Y is contracted while expressing a repulsive force. The spring **31**Y is provided as a separate member from the wire **44**Y, but may be integrally formed with the wire **44**Y on one end portion of the wire **44**Y.

The boss **38**Y is a positioning portion configured to position the high-voltage contact portion **14**Y of the circuit board **10** and the spring **31**Y of the power feeding member **34**Y. The boss **38**Y protrudes from the base portion **39**Yb of the mold member **39**Y in a direction (hereinafter referred to as "protruding direction") R toward the circuit board **10**.

When the circuit board **10** is to be mounted on the power feeding member **34**Y (**34**M, **34**C, **34**K), the boss **38**Y (**38**M, **38**C, **38**K) of the power feeding member **34**Y (**34**M, **34**C, **34**K) is fitted into the boss hole **24**Y (**24**M, **24**C, **24**K) of the circuit board **10**. When the plurality of bosses **38** are fitted into the plurality of boss holes **24**, respectively, the springs **31** of the plurality of power feeding members **34** can be positioned with respect to the plurality of high-voltage contact portions **14** of the circuit board **10**, respectively, so as to be separate from one another.

When the circuit board **10** is mounted on the power feeding member **34**, the boss **38** is arranged between the spring **31** and a portion, which is closest to the spring **31**, of the lower edge **10***b* of the circuit board **10**.

The holding claw **33**Y is formed on the supporting plate **39**Yc so as to hold the circuit board **10**. As illustrated in FIG. **4**B, the holding claw **33**Y has a triangular shape in cross section.

The holding claw **33**Y has an inclined portion **33**Ya inclined downward toward the protruding direction R. The protruding direction R is a direction from a front of the main body **100**A of the image forming apparatus **100** to a rear of the main body **100**A. The holding claw **33**Y has a latching surface (circuit board contact surface) **33**Yb on the side of the base portion **39**Yb. The holding claw **33**Y has a portion **33**Yc which has the maximum height in the vertical direction X between the inclined portion **33**Ya and the latching surface **33**Yb.

When the circuit board **10** is to be mounted on the power feeding member **34**Y, the circuit board **10** is pushed toward the side of the power feeding member **34**Y with respect to the portion **33**Yc of the holding claw **33**Y which has the maximum height in the vertical direction X. The supporting plate **39**Yc is elastically deformable. The circuit board **10** presses the holding claw **33**Y downward so that the supporting plate **39**Yc is deflected downward. With the downward deflection of the supporting plate **39**Yc, the circuit board **10** climbs over the portion **33**Yc of the holding claw **33**Y. The circuit board **10** is pressed toward the latching surface **33**Yb of the holding claw **33**Y due to the repulsive force of the spring **31**Y. The circuit board **10** is fixed by the spring **31**Y and the latching surface **33**Yb.

As illustrated in FIG. **4**B, when the circuit board is not held by the power feeding member **34**Y, in the protruding direction R in which the boss **38**Y protrudes, the boss **38**Y extends more than the spring **31**Y, and the spring **31**Y extends more than the latching surface **33**Yb of the holding claw **33**Y. In other words, in the protruding direction R, a protruding amount of the boss **38**Y is larger than a protruding amount of the spring **31**Y. Further, a distal end portion of the spring **31**Y protrudes in the protruding direction R more than the latching surface **33**Yb of the holding claw **33**Y.

That is, a length L**1** in the protruding direction R from the base portion **39**Yb of the mold member **39**Y to the distal end portion of the spring **31**Y when the spring **31**Y is in a natural state is smaller than a length L**2** in the protruding direction R from the base portion **39**Yb to a distal end portion of the boss **38**Y. Further, the length L**1** is larger than a length L**3** in the protruding direction R from the base portion **39**Yb of the mold member **39**Y to the latching surface **33**Yb of the holding claw **33**Y.

With this configuration, before the spring **31**Y is held in contact with the high-voltage contact portion **14**Y, the circuit board **10** and the power feeding member **34**Y are positioned by the boss **38**Y, that is, the spring **31**Y and the high-voltage contact portion **14**Y are positioned. Therefore, the spring **31**Y is held in contact with the high-voltage contact portion **14**Y without buckling. Further, after being held in contact with the spring **31**Y, the circuit board **10** is further pushed so that the circuit board **10** is latched by the latching surface **33**Yb. As illustrated in FIG. **4**D, the circuit board **10** is fixed by the holding claw **33**Y with a predetermined spring force of the spring **31**Y without using a screw.

In the same way, the respective positioning between springs **31**M, **31**C, and **31**K and the high-voltage contact portions **14**M, **14**C, and **14**K are independently performed by the bosses **38**M, **38**C, and **38**K of the power feeding members **34**M, **34**C, and **34**K. The positioning of the springs **31**M, **31**C, and **31**K and the high-voltage contact portions **14**M, **14**C, and **14**K is the same as the positioning of the spring **31**Y and the high-voltage contact portion **14**Y, and description thereof is omitted.

(Fixing portion)

As illustrated in FIGS. **4**A and **4**C, the mold member **39**Y includes fixing portions **35**Y and **36**Y configured to fix the power feeding member **34**Y. The fixing portion **35**Y has an inverted L-shape, and is integrally formed with the base portion **39**Yb of the mold member **39**Y. The fixing portion **36**Y has an inverted J-shape, and is integrally formed with the supporting plate **39**Yc of the mold member **39**Y.

As illustrated in FIGS. **3** and **4**C, a shelf portion **110***a* which extends toward the protruding direction R is formed on the rear plate **110**. Mounting holes **111**Y and **112**Y, into which the fixing portions **35**Y and **36**Y are inserted, respectively, are formed in the shelf portion **110***a*.

The power feeding member **34**Y is mounted on the rear plate **110** by inserting the fixing portions **35**Y and **36**Y into the mounting holes **111**Y and **112**Y formed in the shelf portion **110***a* of the rear plate **110**, respectively. The mounting holes **111**Y and **112**Y have a sufficient size to receive the fixing portions **35**Y and **36**Y. The mounting holes **111**Y and **112**Y are larger than the fixing portions **35**Y and **36**Y, and a gap between an inner periphery of each of the mounting holes **111**Y and **112**Y and an outer periphery of each of the fixing portions **35**Y and **36**Y is several millimeters. Therefore, even after the power feeding member **34**Y is mounted on the rear plate **110**, the power feeding member **34**Y is movable by approximately several millimeters.

The fixing portions **35**M, **36**M, **35**C, **36**C, **35**K, and **36**K of the power feeding members **34**M, **34**C, and **34**K are the same as the fixing portions **35**Y and **36**Y of the power feeding member **34**Y, and description thereof is omitted. Furthermore, the mounting holes **111**M, **112**M, **111**C, **112**C, **111**K, and **112**K formed in the shelf portion **110***a*, into which the fixing portions **35**M, **36**M, **35**C, **36**C, **35**K, and **36**K are inserted, respectively, are the same as the mounting holes **111**Y and **112**Y, and description thereof is omitted.

FIGS. **5**A and **5**B are explanatory views of the power feeding member **34**Y holding the high-voltage circuit board **10**. FIGS. **5**A and **5**B are views as seen from a side of a solder surface **18** opposite to the mounting surface **11** of the circuit board **10**. FIG. **5**A is an explanatory view of the circuit board **10** in a state in which the circuit board **10** is not deformed. FIG. **5**B is an explanatory view of the circuit board **10** in a state in which the circuit board **10** is deformed in a direction indicated by the arrow B and the position of the boss hole **24**Y is therefore displaced so that the position of the power feeding member **34**Y is displaced.

As is understood from FIG. **5**B, when the circuit board **10** is deformed, the power feeding member **34**Y is movable in the horizontal direction by approximately several millimeters as described above. The boss hole **24**Y and the high-voltage contact portion **14**Y of the circuit board **10** are arranged close to each other. Furthermore, the boss **38**Y and the spring **31**Y of the power feeding member **34**Y are arranged close to each other. Therefore, when the circuit board **10** is deformed, the positional relationship between the boss hole **24**Y and the high-voltage contact portion **14**Y of the circuit board **10** is not substantially changed. Accordingly, even when the circuit board **10** is deformed, the power feeding member **34**Y moves in association with the deformation of the circuit board **10** by the insertion of the boss **38**Y into the boss hole **24**Y of the circuit board **10**, with the result that the connection between the high-voltage contact portion **14**Y and the spring **31**Y can reliably be maintained.

As described above, the plurality of power feeding members **34**, each including the spring **31**, the boss configured to position the circuit board **10**, and the fixing portions **35** and **36** configured to mount the power feeding member **34** so as to be movable with respect to the main body **100**A, are provided separately from one another. Therefore, even when the circuit board **10** is deformed, the reliability of the connection between the spring **31** and the high-voltage contact portion **14** is improved. Furthermore, the circuit board **10** is easily fixed to the power feeding members **34**.

Furthermore, the holding claw **33** is arranged in the vicinity of the spring **31**, and hence the power feeding member **34** can hold the circuit board **10** while preventing the deflection of the circuit board **10**.

As described above, the circuit board **10** has the boss holes **24** formed below the plurality of high-voltage contact portions **14** in the vertical direction X, respectively. The plurality of power feeding members **34** which are separate from one another are provided for the plurality of high-voltage contact portions **14**, respectively. The plurality of power feeding members **34** each include the spring **31**, the boss **38** formed below the spring **31** in the vertical direction X, and the holding claw **33** in the vicinity of the boss **38**. The power feeding member **34** is movable even after being mounted on the rear plate **110**. Therefore, even when the circuit board **10** is deformed, the connection between the spring **31** and the high-voltage contact portion **14** can reliably be maintained. Accordingly, only by the mounting of the circuit board **10** to the power feeding member **34** so that the boss **38** is fitted into the boss hole **24**, the connection between the spring **31** and the high-voltage contact portion **14** can reliably be maintained, with the result that the mounting of the circuit board **10** is facilitated.

According to the embodiment, the plurality of separate power feeding members each includes the connecting portion, the positioning portion, and the latching portion. Therefore, even when the circuit board is deformed, the connection between the voltage output portion of the circuit board and the connecting portion can reliably be maintained.

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application No. 2014-006829, filed Jan. 17, 2014, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. An image forming apparatus configured to form an image on a recording medium, the image forming apparatus comprising:

a plurality of process units to which voltages are applied to perform image forming processes;

a circuit board configured to generate the voltages to be applied to the plurality of process units, respectively; and

a plurality of separate power feeding members configured to supply the voltages generated by the circuit board to the plurality of process units, respectively,

wherein the plurality of separate power feeding members are configured to hold the circuit board,

wherein the circuit board comprises:

a plurality of voltage output portions configured to output the voltages to be applied to the plurality of process units, respectively, the plurality of voltage output portions being arranged at different positions in a direction along an outer edge of the circuit board; and

a plurality of positioning holes configured to position the plurality of separate power feeding members, respectively, and

wherein the plurality of separate power feeding members each comprises:

a connecting portion to be connected to a corresponding one of the plurality of voltage output portions of the circuit board;

a positioning portion to be fitted into a corresponding one of the plurality of positioning holes of the circuit board, the positioning portion being arranged at a position closer to the outer edge of the circuit board than a position of the connecting portion; and

a latching portion configured to latch the circuit board, the latching portion being arranged at a different position from the position of the positioning portion in the direction along the outer edge.

2. An image forming apparatus according to claim **1**, wherein the plurality of separate power feeding members are mounted to a main body of the image forming apparatus so as to be movable with respect to the main body.

3. An image forming apparatus according to claim **1**, wherein the positioning portion is arranged between the connecting portion and a portion, which is closest to the connecting portion, of the outer edge.

4. An image forming apparatus according to claim **1**,

wherein the connecting portion comprises a conducting elastic member,

wherein the positioning portion comprises a protruding portion, and

wherein, when the circuit board is not held by the plurality of separate power feeding members, in a protruding direction in which the protruding portion protrudes, the protruding portion extends more than the conducting elastic member, and the conducting elastic member extends more than a latching surface on which the latching portion latches the circuit board.

5. An image forming apparatus according to claim **1**,

wherein the outer edge comprises a lower edge of the circuit board, and

wherein the lower edge of the circuit board is provided with a recessed portion.

6. An image forming apparatus according to claim **1**, further comprising:

a plurality of photosensitive members; and

a plurality of charging devices to which voltages are applied to charge the plurality of photosensitive members, respectively,

wherein the plurality of process units comprise a plurality of developing devices configured to develop electrostatic latent images formed on the plurality of photosensitive members, respectively,

wherein the circuit board further comprises a plurality of voltage output portions configured to output the voltages to be applied to the plurality of charging devices, respectively,

wherein the outer edge comprises a lower edge of the circuit board,

wherein the plurality of voltage output portions configured to output the voltages to be applied to the plurality of process units, respectively, are arranged in a vicinity of the lower edge, and

wherein the plurality of voltage output portions configured to output the voltages to be applied to the plurality of charging devices, respectively, are arranged in a vicinity of an upper edge of the circuit board at different positions in a direction along the upper edge.

7. An image forming apparatus according to claim **1**, wherein each of the plurality of separate power feeding members comprises a fixing portion to be inserted into a mounting hole formed in the image forming apparatus.

8. An image forming apparatus according to claim **7**, wherein the each of the plurality of separate power feeding members comprises a holding member provided on one end portion thereof, the holding member integrally comprising the connecting portion, the positioning portion, the latching portion, and the fixing portion.

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